SEQUENCE LISTING

<110> DeBonte, Lorin R.
      Fan, Zhegong
      Miao, Guo-Hua

<120> FATTY ACID DESATURASES AND MUTANT SEQUENCES THEREOF

<130> 07148-063003

<140> US 09/771,904
<141> 2001-01-29

<150> US 08/874,109
<151> 1997-06-12

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<210> 1
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<212> DNA
<213> Brassica napus

<220>
<221> CDS
<222> (1)...(1152)
<223> Wild type Fad2

<221> misc_feature
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<223> n = a, g, c, or t/u

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Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser
 1               5                  10                  15

gaa acc gac acc atc aag cgc gta ccc tgc gag aca ccg ccc ttc act      96
Glu Thr Asp Thr Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr
                20                  25                  30

gtc gga gaa ctc aag aaa gca atc cca ccg cac tgt ttc aaa cgc tcg     144
Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser
            35                  40                  45

atc cct cgc tct ttc tcc tac ctc atc tgg gac atc atc ata gcc tcc     192
Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser
        50                  55                  60

tgc ttc tac tac ntc gcc acc act tac ttc cct ctc ctc cct cac cct     240
Cys Phe Tyr Tyr Xaa Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro
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          65                      70                      75                      80

ctc tcc tac ttc gcc tgg cct ctc tac tgg gcc tgc caa ggg tgc gtc        288
Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val
                85                      90                      95

cta acc ggc gtc tgg gtc ata gcc cac gaa tgc ggc cac cac gcc ttc        336
Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe
                100                     105                     110

agc gac tac cag tgg ctt gac gac acc gtc ggt ctc atc ttc cac tcc        384
Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser
                115                     120                     125

ttc ctc ctc gtc cct tac ttc tcc tgg aag tac agt cat cgc agc cac        432
Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Ser His
                130                     135                     140

cat tcc aac act ggc tcc ctc gag aga gac gaa gtg ttt gtc ccc aag        480
His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys
145                     150                     155                     160

aag aag tca gac atc aag tgg tac ggc aag tac ctc aac aac cct ttg        528
Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu
                165                     170                     175

gga cgc acc gtg atg tta acg gtt cag ttc act ctc ggc tgg ccg ttg        576
Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu
                180                     185                     190

tac tta gcc ttc aac gtc tcg gga aga cct tac gac ggc ggc ttc cgt        624
Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Arg
                195                     200                     205

tgc cat ttc cac ccc aac gct ccc atc tac aac gac cgc gag cgt ctc        672
Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu
                210                     215                     220

cag ata tac atc tcc gac gct ggc atc ctc gcc gtc tgc tac ggt ctc        720
Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu
225                     230                     235                     240

ttc cgt tac gcc gcc ggc cag gga gtg gcc tcg atg gtc tgc ttc tac        768
Phe Arg Tyr Ala Ala Gly Gln Gly Val Ala Ser Met Val Cys Phe Tyr
                245                     250                     255

gga gtc ccg ctt ctg att gtc aat ggt ttc ctc gtg ttg atc act tac        816
Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr
                260                     265                     270

ttg cag cac acg cat cct tcc ctg cct cac tac gat tcg tcc gag tgg        864
Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp
                275                     280                     285
```

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gat tgg ttc agg gga gct ttg gct acc gtt gac aga gac tac gga atc      912
Asp Trp Phe Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile
    290             295             300

ttg aac aag gtc ttc cac aat att acc gac acg cac gtg gcc cat cat      960
Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His
305             310             315             320

ccg ttc tcc acg atg ccg cat tat cac gcg atg gaa gct acc aag gcg     1008
Pro Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala
            325             330             335

ata aag ccg ata ctg gga gag tat tat cag ttc gat ggg acg ccg gtg     1056
Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Phe Asp Gly Thr Pro Val
            340             345             350

gtt aag gcg atg tgg agg gag gcg aag gag tgt atc tat gtg gaa ccg     1104
Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro
            355             360             365

gac agg caa ggt gag aag aaa ggt gtg ttc tgg tac aac aat aag tta     1152
Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu
    370             375             380

tga                                                                  1155
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<210> 2
<211> 384
<212> PRT
<213> Brassica napus

<220>
<223> Xaa = Phe, Leu, Ile, or Val

<400> 2
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Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser
1               5               10              15
Glu Thr Asp Thr Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr
            20              25              30
Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser
        35              40              45
Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser
    50              55              60
Cys Phe Tyr Tyr Xaa Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro
65              70              75              80
Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val
            85              90              95
Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe
            100             105             110
Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser
    115             120             125
Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Ser His
    130             135             140
```

```
His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys
145                 150             155                 160
Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu
                165             170                 175
Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu
                180             185                 190
Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Arg
            195             200             205
Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu
        210             215             220
Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu
225                 230             235                 240
Phe Arg Tyr Ala Ala Gly Gln Gly Val Ala Ser Met Val Cys Phe Tyr
            245             250             255
Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr
            260             265             270
Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp
        275             280             285
Asp Trp Phe Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile
    290             295             300
Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His
305             310             315                 320
Pro Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala
                325             330             335
Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Phe Asp Gly Thr Pro Val
            340             345             350
Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro
        355             360             365
Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu
    370             375             380
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<210>  3
<211>  1155
<212>  DNA
<213>  Brassica napus

<220>
<221>  CDS
<222>  (1)...(1152)
<223>  G to A transversion mutation at nucleotide 316

<221>  misc_feature
<222>  205
<223>  n = a, g, c, or t/u

<400>  3
atg ggt gca ggt gga aga atg caa gtg tct cct ccc tcc aag aag tct      48
Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser
 1               5                  10                  15

gaa acc gac acc atc aag cgc gta ccc tgc gag aca ccg ccc ttc act      96
Glu Thr Asp Thr Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr
            20                  25                  30
```

```
gtc gga gaa ctc aag aaa gca atc cca ccg cac tgt ttc aaa cgc tcg          144
Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser
         35                  40                  45

atc cct cgc tct ttc tcc tac ctc atc tgg gac atc atc ata gcc tcc          192
Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser
     50                  55                  60

tgc ttc tac tac ntc gcc acc act tac ttc cct ctc ctc cct cac cct          240
Cys Phe Tyr Tyr Xaa Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro
 65                  70                  75                  80

ctc tcc tac ttc gcc tgg cct ctc tac tgg gcc tgc caa ggg tgc gtc          288
Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val
                 85                  90                  95

cta acc ggc gtc tgg gtc ata gcc cac aag tgc ggc cac cac gcc ttc          336
Leu Thr Gly Val Trp Val Ile Ala His Lys Cys Gly His His Ala Phe
                100                 105                 110

agc gac tac cag tgg ctt gac gac acc gtc ggt ctc atc ttc cac tcc          384
Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser
                115                 120                 125

ttc ctc ctc gtc cct tac ttc tcc tgg aag tac agt cat cgc agc cac          432
Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Ser His
     130                 135                 140

cat tcc aac act ggc tcc ctc gag aga gac gaa gtg ttt gtc ccc aag          480
His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys
145                 150                 155                 160

aag aag tca gac atc aag tgg tac ggc aag tac ctc aac aac cct ttg          528
Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu
                165                 170                 175

gga cgc acc gtg atg tta acg gtt cag ttc act ctc ggc tgg ccg ttg          576
Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu
                180                 185                 190

tac tta gcc ttc aac gtc tcg gga aga cct tac gac ggc ggc ttc cgt          624
Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Arg
                195                 200                 205

tgc cat ttc cac ccc aac gct ccc atc tac aac gac cgc gag cgt ctc          672
Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu
         210                 215                 220

cag ata tac atc tcc gac gct ggc atc ctc gcc gtc tgc tac ggt ctc          720
Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu
225                 230                 235                 240
```

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ttc cgt tac gcc gcc ggc cag gga gtg gcc tcg atg gtc tgc ttc tac        768
Phe Arg Tyr Ala Ala Gly Gln Gly Val Ala Ser Met Val Cys Phe Tyr
            245                 250                 255

gga gtc ccg ctt ctg att gtc aat ggt ttc ctc gtg ttg atc act tac        816
Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr
            260                 265                 270

ttg cag cac acg cat cct tcc ctg cct cac tac gat tcg tcc gag tgg        864
Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp
            275                 280                 285

gat tgg ttc agg gga gct ttg gct acc gtt gac aga gac tac gga atc        912
Asp Trp Phe Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile
            290                 295                 300

ttg aac aag gtc ttc cac aat att acc gac acg cac gtg gcc cat cat        960
Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His
305                 310                 315                 320

ccg ttc tcc acg atg ccg cat tat cac gcg atg gaa gct acc aag gcg       1008
Pro Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala
                325                 330                 335

ata aag ccg ata ctg gga gag tat tat cag ttc gat ggg acg ccg gtg       1056
Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Phe Asp Gly Thr Pro Val
            340                 345                 350

gtt aag gcg atg tgg agg gag gcg aag gag tgt atc tat gtg gaa ccg       1104
Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro
            355                 360                 365

gac agg caa ggt gag aag aaa ggt gtg ttc tgg tac aac aat aag tta       1152
Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu
            370                 375                 380

tga                                                                     1155
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<210> 4
<211> 384
<212> PRT
<213> Brassica napus

<220>
<223> Xaa = Phe, Leu, Ile, or Val

<400> 4
Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser
1               5                   10                  15
Glu Thr Asp Thr Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr
            20                  25                  30
Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser
            35                  40                  45
```

```
Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser
    50                      55                  60
Cys Phe Tyr Tyr Xaa Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro
65              70                  75                      80
Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val
                85                  90                  95
Leu Thr Gly Val Trp Val Ile Ala His Lys Cys Gly His His Ala Phe
            100             105             110
Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser
        115             120             125
Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Ser His
    130             135             140
His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys
145             150             155             160
Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu
                165             170             175
Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu
            180             185             190
Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Arg
        195             200             205
Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu
    210             215             220
Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu
225             230             235             240
Phe Arg Tyr Ala Ala Gly Gln Gly Val Ala Ser Met Val Cys Phe Tyr
            245             250             255
Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr
            260             265             270
Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp
        275             280             285
Asp Trp Phe Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile
    290             295             300
Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His
305             310             315             320
Pro Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala
            325             330             335
Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Phe Asp Gly Thr Pro Val
            340             345             350
Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro
    355             360             365
Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu
    370             375             380
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<210> 5
<211> 1155
<212> DNA
<213> Brassica napus

<220>
<221> CDS
<222> (1)...(1152)
<223> Wild type Fad2

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Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser
 1               5                  10                  15

gaa acc gac aac atc aag cgc gta ccc tgc gag aca ccg ccc ttc act      96
Glu Thr Asp Asn Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr
                20                  25                  30

gtc gga gaa ctc aag aaa gca atc cca ccg cac tgt ttc aaa cgc tcg     144
Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser
            35                  40                  45

atc cct cgc tct ttc tcc tac ctc atc tgg gac atc atc ata gcc tcc     192
Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser
        50                  55                  60

tgc ttc tac tac gtc gcc acc act tac ttc cct ctc ctc cct cac cct     240
Cys Phe Tyr Tyr Val Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro
 65                  70                  75                  80

ctc tcc tac ttc gcc tgg cct ctc tac tgg gcc tgc cag ggc tgc gtc     288
Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val
                85                  90                  95

cta acc ggc gtc tgg gtc ata gcc cac gag tgc ggc cac cac gcc ttc     336
Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe
            100                 105                 110

agc gac tac cag tgg ctg gac gac acc gtc ggc ctc atc ttc cac tcc     384
Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser
            115                 120                 125

ttc ctc ctc gtc cct tac ttc tcc tgg aag tac agt cat cga cgc cac     432
Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His
        130                 135                 140

cat tcc aac act ggc tcc ctc gag aga gac gaa gtg ttt gtc ccc aag     480
His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys
145                 150                 155                 160

aag aag tca gac atc aag tgg tac ggc aag tac ctc aac aac cct ttg     528
Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu
                165                 170                 175

gga cgc acc gtg atg tta acg gtt cag ttc act ctc ggc tgg cct ttg     576
Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu
            180                 185                 190

tac tta gcc ttc aac gtc tcg ggg aga cct tac gac ggc ggc ttc gct     624
Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Ala
            195                 200                 205
```

```
tgc cat ttc cac ccc aac gct ccc atc tac aac gac cgc gag cgt ctc      672
Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu
    210             215             220

cag ata tac atc tcc gac gct ggc atc ctc gcc gtc tgc tac ggt ctc      720
Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu
225             230             235             240

tac cgc tac gct gct gtc caa gga gtt gcc tcg atg gtc tgc ttc tac      768
Tyr Arg Tyr Ala Ala Val Gln Gly Val Ala Ser Met Val Cys Phe Tyr
            245             250             255

gga gtt ccg ctt ctg att gtc aat ggg ttc tta gtt ttg atc act tac      816
Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr
            260             265             270

ttg cag cac acg cat cct tcc ctg cct cac tat gac tcg tct gag tgg      864
Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp
            275             280             285

gat tgg ttg agg gga gct ttg gcc acc gtt gac aga gac tac gga atc      912
Asp Trp Leu Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile
        290             295             300

ttg aac aag gtc ttc cac aat atc acg gac acg cac gtg gcg cat cac      960
Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His
305             310             315             320

ctg ttc tcg acc atg ccg cat tat cat gcg atg gaa gct acg aag gcg     1008
Leu Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala
                325             330             335

ata aag ccg ata ctg gga gag tat tat cag ttg cat ggg acg ccg gtg     1056
Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Leu His Gly Thr Pro Val
            340             345             350

gtt aag gcg atg tgg agg gag gcg aag gag tgt atc tat gtg gaa ccg     1104
Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro
        355             360             365

gac agg caa ggt gag aag aaa ggt gtg ttc tgg tac aac aat aag tta     1152
Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu
        370             375             380

tga                                                                  1155


<210> 6
<211> 384
<212> PRT
<213> Brassica napus

<400> 6
Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser
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Glu Thr Asp Asn Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr
 .                  20                        25                    30
Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser
                   35                        40                    45
Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser
         50                        55                    60
Cys Phe Tyr Tyr Val Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro
 65                        70                        75                    80
Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val
                   85                        90                    95
Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe
                  100                       105                   110
Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser
                  115                       120                   125
Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His
         130                       135                   140
His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys
145                       150                       155                   160
Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu
                  165                       170                   175
Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu
                  180                       185                   190
Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Ala
                  195                       200                   205
Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu
         210                       215                   220
Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu
225                       230                       235                   240
Tyr Arg Tyr Ala Ala Val Gln Gly Val Ala Ser Met Val Cys Phe Tyr
                  245                       250                   255
Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr
                  260                       265                   270
Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp
         275                       280                       285
Asp Trp Leu Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile
         290                       295                   300
Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His
305                       310                       315                   320
Leu Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala
                  325                       330                   335
Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Leu His Gly Thr Pro Val
                  340                       345                   350
Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro
         355                       360                   365
Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu
         370                       375                   380
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<210> 7
<211> 1155
<212> DNA
<213> Brassica napus

<220>

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<221> CDS
<222> (1)...(1152)
<223> T to A transversion mutation at nucleotide 515

<400> 7
atg ggt gca ggt gga aga atg caa gtg tct cct ccc tcc aaa aag tct        48
Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser
1               5                   10                  15

gaa acc gac aac atc aag cgc gta ccc tgc gag aca ccg ccc ttc act        96
Glu Thr Asp Asn Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr
                20                  25                  30

gtc gga gaa ctc aag aaa gca atc cca ccg cac tgt ttc aaa cgc tcg       144
Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser
            35                  40                  45

atc cct cgc tct ttc tcc tac ctc atc tgg gac atc atc ata gcc tcc       192
Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser
        50                  55                  60

tgc ttc tac tac gtc gcc acc act tac ttc cct ctc ctc cct cac cct       240
Cys Phe Tyr Tyr Val Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro
65                  70                  75                  80

ctc tcc tac ttc gcc tgg cct ctc tac tgg gcc tgc cag ggc tgc gtc       288
Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val
                85                  90                  95

cta acc ggc gtc tgg gtc ata gcc cac gag tgc ggc cac cac gcc ttc       336
Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe
            100                 105                 110

agc gac tac cag tgg ctg gac gac acc gtc ggc ctc atc ttc cac tcc       384
Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser
            115                 120                 125

ttc ctc ctc gtc cct tac ttc tcc tgg aag tac agt cat cga cgc cac       432
Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His
        130                 135                 140

cat tcc aac act ggc tcc ctc gag aga gac gaa gtg ttt gtc ccc aag       480
His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys
145                 150                 155                 160

aag aag tca gac atc aag tgg tac ggc aag tac cac aac aac cct ttg       528
Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr His Asn Asn Pro Leu
                165                 170                 175

gga cgc acc gtg atg tta acg gtt cag ttc act ctc ggc tgg cct ttg       576
Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu
            180                 185                 190
```

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tac tta gcc ttc aac gtc tcg ggg aga cct tac gac ggc ggc ttc gct        624
Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Ala
        195                 200                 205

tgc cat ttc cac ccc aac gct ccc atc tac aac gac cgc gag cgt ctc        672
Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu
        210                 215                 220

cag ata tac atc tcc gac gct ggc atc ctc gcc gtc tgc tac ggt ctc        720
Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu
225                 230                 235                 240

tac cgc tac gct gct gtc caa gga gtt gcc tcg atg gtc tgc ttc tac        768
Tyr Arg Tyr Ala Ala Val Gln Gly Val Ala Ser Met Val Cys Phe Tyr
                245                 250                 255

gga gtt ccg ctt ctg att gtc aat ggg ttc tta gtt ttg atc act tac        816
Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr
                260                 265                 270

ttg cag cac acg cat cct tcc ctg cct cac tat gac tcg tct gag tgg        864
Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp
                275                 280                 285

gat tgg ttg agg gga gct ttg gcc acc gtt gac aga gac tac gga atc        912
Asp Trp Leu Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile
        290                 295                 300

ttg aac aag gtc ttc cac aat atc acg gac acg cac gtg gcg cat cac        960
Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His
305                 310                 315                 320

ctg ttc tcg acc atg ccg cat tat cat gcg atg gaa gct acg aag gcg       1008
Leu Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala
                325                 330                 335

ata aag ccg ata ctg gga gag tat tat cag ttg cat ggg acg ccg gtg       1056
Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Leu His Gly Thr Pro Val
                340                 345                 350

gtt aag gcg atg tgg agg gag gcg aag gag tgt atc tat gtg gaa ccg       1104
Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro
                355                 360                 365

gac agg caa ggt gag aag aaa ggt gtg ttc tgg tac aac aat aag tta       1152
Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu
        370                 375                 380

tga                                                                    1155
```

<210> 8
<211> 384
<212> PRT

<210> 9... 

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<213> Brassica napus

<400> 8
Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser
1               5               10              15
Glu Thr Asp Asn Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr
            20              25              30
Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser
        35              40              45
Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser
    50              55              60
Cys Phe Tyr Tyr Val Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro
65              70              75              80
Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val
            85              90              95
Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe
        100             105             110
Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser
        115             120             125
Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His
    130             135             140
His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys
145             150             155             160
Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr His Asn Asn Pro Leu
            165             170             175
Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu
        180             185             190
Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Ala
        195             200             205
Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu
    210             215             220
Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu
225             230             235             240
Tyr Arg Tyr Ala Ala Val Gln Gly Val Ala Ser Met Val Cys Phe Tyr
            245             250             255
Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr
        260             265             270
Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp
        275             280             285
Asp Trp Leu Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile
290             295             300
Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His
305             310             315             320
Leu Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala
            325             330             335
Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Leu His Gly Thr Pro Val
        340             345             350
Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro
        355             360             365
Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu
370             375             380
```

<210> 9

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<211> 1155
<212> DNA
<213> Brassica napus

<220>
<221> CDS
<222> (1)...(1152)

<400> 9
atg ggt gca ggt gga aga atg caa gtg tct cct ccc tcc aaa aag tct          48
Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser
 1               5                  10                  15

gaa acc gac aac atc aag cgc gta ccc tgc gag aca ccg ccc ttc act          96
Glu Thr Asp Asn Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr
                20                  25                  30

gtc gga gaa ctc aag aaa gca atc cca ccg cac tgt ttc aaa cgc tcg         144
Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser
            35                  40                  45

atc cct cgc tct ttc tcc tac ctc atc tgg gac atc atc ata gcc tcc         192
Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser
        50                  55                  60

tgc ttc tac tac gtc gcc acc act tac ttc cct ctc ctc cct cac cct         240
Cys Phe Tyr Tyr Val Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro
65                  70                  75                  80

ctc tcc tac ttc gcc tgg cct ctc tac tgg gcc tgc cag ggc tgc gtc         288
Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val
                85                  90                  95

cta acc ggc gtc tgg gtc ata gcc cac gag tgc ggc cac cac gcc ttc         336
Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe
                100                 105                 110

agc gac tac cag tgg ctg gac gac acc gtc ggc ctc atc ttc cac tcc         384
Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser
            115                 120                 125

ttc ctc ctc gtc cct tac ttc tcc tgg aag tac agt cat cga cgc cac         432
Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His
        130                 135                 140

cat tcc aac act ggc tcc ctc gag aga gac gaa gtg ttt gtc ccc aag         480
His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys
145                 150                 155                 160

aag aag tca gac atc aag tgg tac ggc aag tac ctc aac aac cct ttg         528
Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu
                165                 170                 175
```

```
gga cgc acc gtg atg tta acg gtt cag ttc act ctc ggc tgg cct ttg        576
Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu
            180                 185                 190

tac tta gcc ttc aac gtc tcg ggg aga cct tac gac ggc ggc ttc gct        624
Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Ala
            195                 200                 205

tgc cat ttc cac ccc aac gct ccc atc tac aac gac cgt gag cgt ctc        672
Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu
            210                 215                 220

cag ata tac atc tcc gac gct ggc atc ctc gcc gtc tgc tac ggt ctc        720
Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu
225                 230                 235                 240

tac cgc tac gct gct gtc caa gga gtt gcc tcg atg gtc tgc ttc tac        768
Tyr Arg Tyr Ala Ala Val Gln Gly Val Ala Ser Met Val Cys Phe Tyr
            245                 250                 255

gga gtt cct ctt ctg att gtc aac ggg ttc tta gtt ttg atc act tac        816
Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr
            260                 265                 270

ttg cag cac acg cat cct tcc ctg cct cac tat gac tcg tct gag tgg        864
Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp
            275                 280                 285

gat tgg ttg agg gga gct ttg gcc acc gtt gac aga gac tac gga atc        912
Asp Trp Leu Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile
            290                 295                 300

ttg aac aag gtc ttc cac aat atc acg gac acg cac gtg gcg cat cac        960
Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His
305                 310                 315                 320

ctg ttc tcg acc atg ccg cat tat cat gcg atg gaa gct acg aag gcg       1008
Leu Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala
            325                 330                 335

ata aag ccg ata ctg gga gag tat tat cag ttc gat ggg acg ccg gtg       1056
·Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Phe Asp Gly Thr Pro Val
            340                 345                 350

gtt aag gcg atg tgg agg gag gcg aag gag tgt atc tat gtg gaa ccg       1104
Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro
            355                 360                 365

gac agg caa ggt gag aag aaa ggt gtg ttc tgg tac aac aat aag tta       1152
Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu
            370                 375                 380

tga                                                                    1155
```

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<210> 10
<211> 384
<212> PRT
<213> Brassica napus

<400> 10
Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser
 1               5                  10                  15
Glu Thr Asp Asn Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr
                20                  25                  30
Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser
            35                  40                  45
Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser
    50                  55                  60
Cys Phe Tyr Tyr Val Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro
65                  70                  75                  80
Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val
                85                  90                  95
Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe
            100                 105                 110
Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser
            115                 120                 125
Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His
    130                 135                 140
His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys
145                 150                 155                 160
Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu
                165                 170                 175
Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu
            180                 185                 190
Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Ala
    195                 200                 205
Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu
    210                 215                 220
Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu
225                 230                 235                 240
Tyr Arg Tyr Ala Ala Val Gln Gly Val Ala Ser Met Val Cys Phe Tyr
                245                 250                 255
Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr
            260                 265                 270
Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp
    275                 280                 285
Asp Trp Leu Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile
    290                 295                 300
Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His
305                 310                 315                 320
Leu Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala
            325                 330                 335
Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Phe Asp Gly Thr Pro Val
            340                 345                 350
Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro
            355                 360                 365
Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu
```

370                    375                    380

<210> 11
<211> 1155
<212> DNA
<213> Brassica napus

<220>
<221> CDS
<222> (1)...(1152)

<400> 11

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atg ggt gca ggt gga aga atg caa gtg tct cct ccc tcc aaa aag tct        48
Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser
 1               5                  10                  15

gaa acc gac aac atc aag cgc gta ccc tgc gag aca ccg ccc ttc act        96
Glu Thr Asp Asn Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr
            20                  25                  30

gtc gga gaa ctc aag aaa gca atc cca ccg cac tgt ttc aaa cgc tcg       144
Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser
        35                  40                  45

atc cct cgc tct ttc tcc tac ctc atc tgg gac atc atc ata gcc tcc       192
Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser
    50                  55                  60

tgc ttc tac tac gtc gcc acc act tac ttc cct ctc ctc cct cac cct       240
Cys Phe Tyr Tyr Val Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro
 65                  70                  75                  80

ctc tcc tac ttc gcc tgg cct ctc tac tgg gcc tgc cag ggc tgc gtc       288
Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val
                85                  90                  95

cta acc ggc gtc tgg gtc ata gcc cac aag tgc ggc cac cac gcc ttc       336
Leu Thr Gly Val Trp Val Ile Ala His Lys Cys Gly His His Ala Phe
            100                 105                 110

agc gac tac cag tgg ctg gac gac acc gtc ggc ctc atc ttc cac tcc       384
Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser
            115                 120                 125

ttc ctc ctc gtc cct tac ttc tcc tgg aag tac agt cat cga cgc cac       432
Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His
        130                 135                 140

cat tcc aac act ggc tcc ctc gag aga gac gaa gtg ttt gtc ccc aag       480
His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys
145                 150                 155                 160
```

```
aag aag tca gac atc aag tgg tac ggc aag tac ctc aac aac cct ttg        528
Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu
                165             170             175

gga cgc acc gtg atg tta acg gtt cag ttc act ctc ggc tgg cct ttg        576
Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu
                180             185             190

tac tta gcc ttc aac gtc tcg ggg aga cct tac gac ggc ggc ttc gct        624
Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Ala
            195             200             205

tgc cat ttc cac ccc aac gct ccc atc tac aac gac cgt gag cgt ctc        672
Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu
        210             215             220

cag ata tac atc tcc gac gct ggc atc ctc gcc gtc tgc tac ggt ctc        720
Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu
225             230             235             240

tac cgc tac gct gct gtc caa gga gtt gcc tcg atg gtc tgc ttc tac        768
Tyr Arg Tyr Ala Ala Val Gln Gly Val Ala Ser Met Val Cys Phe Tyr
                245             250             255

gga gtt cct ctt ctg att gtc aac ggg ttc tta gtt ttg atc act tac        816
Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr
                260             265             270

ttg cag cac acg cat cct tcc ctg cct cac tat gac tcg tct gag tgg        864
Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp
                275             280             285

gat tgg ttg agg gga gct ttg gcc acc gtt gac aga gac tac gga atc        912
Asp Trp Leu Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile
        290             295             300

ttg aac aag gtc ttc cac aat atc acg gac acg cac gtg gcg cat cac        960
Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His
305             310             315             320

ctg ttc tcg acc atg ccg cat tat cat gcg atg gaa gct acg aag gcg       1008
Leu Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala
                325             330             335

ata aag ccg ata ctg gga gag tat tat cag ttc gat ggg acg ccg gtg      1056
Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Phe Asp Gly Thr Pro Val
                340             345             350

gtt aag gcg atg tgg agg gag gcg aag gag tgt atc tat gtg gaa ccg      1104
Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro
                355             360             365
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gac agg caa ggt gag aag aaa ggt gtg ttc tgg tac aac aat aag tta      1152
Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu
    370             375             380

tga                                                                   1155

<210> 12
<211> 384
<212> PRT
<213> Brassica napus

<400> 12
Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser
 1               5              10              15
Glu Thr Asp Asn Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr
            20              25              30
Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser
        35              40              45
Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser
    50              55              60
Cys Phe Tyr Tyr Val Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro
 65              70              75              80
Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val
            85              90              95
Leu Thr Gly Val Trp Val Ile Ala His Lys Cys Gly His His Ala Phe
        100             105             110
Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser
    115             120             125
Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His
    130             135             140
His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys
145             150             155             160
Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu
            165             170             175
Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu
            180             185             190
Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Ala
        195             200             205
Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu
    210             215             220
Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu
225             230             235             240
Tyr Arg Tyr Ala Ala Val Gln Gly Val Ala Ser Met Val Cys Phe Tyr
            245             250             255
Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr
        260             265             270
Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp
    275             280             285
Asp Trp Leu Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile
    290             295             300
Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His
305             310             315             320
Leu Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala
```

```
                 325                    330                    335
Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Phe Asp Gly Thr Pro Val
                 340                    345                    350
Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro
             355                    360                    365
Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu
         370                    375                    380
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<210> 13
<211> 1155
<212> DNA
<213> Brassica napus

<220>
<221> CDS
<222> (1)...(1152)

<400> 13

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atg ggt gca ggt gga aga atg caa gtg tct cct ccc tcc aag aag tct    48
Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser
 1               5                  10                  15

gaa acc gac acc atc aag cgc gta ccc tgc gag aca ccg ccc ttc act    96
Glu Thr Asp Thr Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr
                 20                  25                  30

gtc gga gaa ctc aag aaa gca atc cca ccg cac tgt ttc aaa cgc tcg   144
Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser
             35                  40                  45

atc cct cgc tct ttc tcc tac ctc atc tgg gac atc atc ata gcc tcc   192
Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser
         50                  55                  60

tgc ttc tac tac gtc gcc acc act tac ttc cct ctc ctc cct cac cct   240
Cys Phe Tyr Tyr Val Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro
 65                  70                  75                  80

ctc tcc tac ttc gcc tgg cct ctc tac tgg gcc tgc caa ggg tgc gtc   288
Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val
                 85                  90                  95

cta acc ggc gtc tgg gtc ata gcc cac gag tgc ggc cac cac gcc ttc   336
Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe
                100                    105                    110

agc gac tac cag tgg ctt gac gac acc gtc ggt ctc atc ttc cac tcc   384
Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser
             115                    120                    125

ttc ctc ctc gtc cct tac ttc tcc tgg aag tac agt cat cga cgc cac   432
Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His
         130                    135                    140
```

```
cat tcc aac act ggc tcc ctc gag aga gac gaa gtg ttt gtc ccc aag        480
His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys
145             150             155             160

aag aag tca gac atc aag tgg tac ggc aag tac ctc aac aac cct ttg        528
Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu
                165             170             175

gga cgc acc gtg atg tta acg gtt cag ttc act ctc ggc tgg ccg ttg        576
Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu
                180             185             190

tac tta gcc ttc aac gtc tcg gga aga cct tac gac ggc ggc ttc gct        624
Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Ala
                195             200             205

tgc cat ttc cac ccc aac gct ccc atc tac aac gac cgc gag cgt ctc        672
Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu
        210             215             220

cag ata tac atc tcc gac gct ggc atc ctc gcc gtc tgc tac ggt ctc        720
Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu
225             230             235             240

ttc cgt tac gcc gcc gcg cag gga gtg gcc tcg atg gtc tgc ttc tac        768
Phe Arg Tyr Ala Ala Ala Gln Gly Val Ala Ser Met Val Cys Phe Tyr
                245             250             255

gga gtc ccg ctt ctg att gtc aat ggt ttc ctc gtg ttg atc act tac        816
Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr
                260             265             270

ttg cag cac acg cat cct tcc ctg cct cac tac gat tcg tcc gag tgg        864
Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp
        275             280             285

gat tgg ttg agg gga gct ttg gct acc gtt gac aga gac tac gga atc        912
Asp Trp Leu Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile
        290             295             300

ttg aac aag gtc ttc cac aat att acc gac acg cac gtg gcg cat cat        960
Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His
305             310             315             320

ctg ttc tcc acg atg ccg cat tat cac gcg atg gaa gct acc aag gcg       1008
Leu Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala
                325             330             335

ata aag ccg ata ctg gga gag tat tat cag ttc gat ggg acg ccg gtg       1056
Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Phe Asp Gly Thr Pro Val
        340             345             350
```

```
gtt aag gcg atg tgg agg gag gcg aag gag tgt atc tat gtg gaa ccg    1104
Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro
        355                 360                 365

gac agg caa ggt gag aag aaa ggt gtg ttc tgg tac aac aat aag tta    1152
Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu
        370                 375                 380

tga                                                                 1155
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<210> 14
<211> 384
<212> PRT
<213> Brassica napus

<400> 14

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Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser
  1               5                  10                  15
Glu Thr Asp Thr Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr
            20                  25                  30
Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser
        35                  40                  45
Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser
    50                  55                  60
Cys Phe Tyr Tyr Val Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro
 65                  70                  75                  80
Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val
                85                  90                  95
Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe
            100                 105                 110
Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser
        115                 120                 125
Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His
    130                 135                 140
His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys
145                 150                 155                 160
Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu
                165                 170                 175
Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu
            180                 185                 190
Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Ala
        195                 200                 205
Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu
    210                 215                 220
Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu
225                 230                 235                 240
Phe Arg Tyr Ala Ala Ala Gln Gly Val Ala Ser Met Val Cys Phe Tyr
                245                 250                 255
Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr
            260                 265                 270
Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp
        275                 280                 285
Asp Trp Leu Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile
```

```
           290                    295                    300
Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His
305                    310                    315                    320
Leu Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala
                   325                    330                    335
Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Phe Asp Gly Thr Pro Val
                   340                    345                    350
Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro
              355                    360                    365
Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu
         370                    375                    380
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<210> 15
<211> 1155
<212> DNA
<213> Brassica napus

<220>
<221> CDS
<222> (1)...(1152)

<400> 15

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atg ggt gca ggt gga aga atg caa gtg tct cct ccc tcc aag aag tct      48
Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser
 1                   5                   10                  15


gaa acc gac acc atc aag cgc gta ccc tgc gag aca ccg ccc ttc act      96
Glu Thr Asp Thr Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr
                 20                  25                   30


gtc gga gaa ctc aag aaa gca atc cca ccg cac tgt ttc aaa cgc tcg     144
Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser
             35                  40                  45


atc cct cgc tct ttc tcc tac ctc atc tgg gac atc atc ata gcc tcc     192
Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser
         50                  55                  60


tgc ttc tac tac gtc gcc acc act tac ttc cct ctc ctc cct cac cct     240
Cys Phe Tyr Tyr Val Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro
 65                  70                  75                  80


ctc tcc tac ttc gcc tgg cct ctc tac tgg gcc tgc caa ggg tgc gtc     288
Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val
                 85                  90                  95


cta acc ggc gtc tgg gtc ata gcc cac gag tgc ggc cac cac gcc ttc     336
Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe
                100                 105                 110


agc gac tac cag tgg ctt gac gac acc gtc ggt ctc atc ttc cac tcc     384
Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser
             115                 120                 125
```

```
ttc ctc ctc gtc cct tac ttc tcc tgg aag tac agt cat cga cgc cac       432
Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His
        130                 135                 140

cat tcc aac act ggc tcc ctc gag aga gac gaa gtg ttt gtc ccc aag       480
His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys
145                 150                 155                 160

aag aag tca gac atc aag tgg tac ggc aag tac cac aac aac cct ttg       528
Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr His Asn Asn Pro Leu
                165                 170                 175

gga cgc acc gtg atg tta acg gtt cag ttc act ctc ggc tgg ccg ttg       576
Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu
                180                 185                 190

tac tta gcc ttc aac gtc tcg gga aga cct tac gac ggc ggc ttc gct       624
Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Ala
        195                 200                 205

tgc cat ttc cac ccc aac gct ccc atc tac aac gac cgc gag cgt ctc       672
Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu
        210                 215                 220

cag ata tac atc tcc gac gct ggc atc ctc gcc gtc tgc tac ggt ctc       720
Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu
225                 230                 235                 240

ttc cgt tac gcc gcc gcg cag gga gtg gcc tcg atg gtc tgc ttc tac       768
Phe Arg Tyr Ala Ala Ala Gln Gly Val Ala Ser Met Val Cys Phe Tyr
                245                 250                 255

gga gtc ccg ctt ctg att gtc aat ggt ttc ctc gtg ttg atc act tac       816
Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr
                260                 265                 270

ttg cag cac acg cat cct tcc ctg cct cac tac gat tcg tcc gag tgg       864
Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp
        275                 280                 285

gat tgg ttg agg gga gct ttg gct acc gtt gac aga gac tac gga atc       912
Asp Trp Leu Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile
        290                 295                 300

ttg aac aag gtc ttc cac aat att acc gac acg cac gtg gcg cat cat       960
Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His
305                 310                 315                 320

ctg ttc tcc acg atg ccg cat tat cac gcg atg gaa gct acc aag gcg      1008
Leu Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala
                325                 330                 335
```

```
ata aag ccg ata ctg gga gag tat tat cag ttc gat ggg acg ccg gtg      1056
Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Phe Asp Gly Thr Pro Val
        340                     345                 350

gtt aag gcg atg tgg agg gag gcg aag gag tgt atc tat gtg gaa ccg      1104
Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro
        355                     360                 365

gac agg caa ggt gag aag aaa ggt gtg ttc tgg tac aac aat aag tta      1152
Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu
        370                     375                 380

tga                                                                   1155
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<210> 16
<211> 384
<212> PRT
<213> Brassica napus

<400> 16

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Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser
 1               5                   10                  15
Glu Thr Asp Thr Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr
            20                  25                  30
Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser
        35                  40                  45
Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser
    50                  55                  60
Cys Phe Tyr Tyr Val Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro
65                  70                  75                  80
Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val
                85                  90                  95
Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe
            100                 105                 110
Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser
            115                 120                 125
Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His
    130                 135                 140
His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys
145                 150                 155                 160
Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr His Asn Asn Pro Leu
                165                 170                 175
Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu
            180                 185                 190
Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Ala
        195                 200                 205
Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu
    210                 215                 220
Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu
225                 230                 235                 240
Phe Arg Tyr Ala Ala Ala Gln Gly Val Ala Ser Met Val Cys Phe Tyr
                245                 250                 255
Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr
```

```
              260                     265                     270
Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp
          275                     280                     285
Asp Trp Leu Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile
          290                     295                     300
Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His
305                     310                     315                     320
Leu Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala
                  325                     330                     335
Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Phe Asp Gly Thr Pro Val
                  340                     345                     350
Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro
              355                     360                     365
Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu
          370                     375                     380
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<210> 17
<211> 1155
<212> DNA
<213> Brassica napus

<220>
<221> CDS
<222> (1)...(1152)

<400> 17

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atg ggt gca ggt gga aga atg caa gtg tct cct ccc tcc aag aag tct    48
Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser
 1               5                  10                      15

gaa acc gac acc atc aag cgc gta ccc tgc gag aca ccg ccc ttc act    96
Glu Thr Asp Thr Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr
              20                  25                  30

gtc gga gaa ctc aag aaa gca atc cca ccg cac tgt ttc aaa cgc tcg   144
Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser
          35                  40                  45

atc cct cgc tct ttc tcc tac ctc atc tgg gac atc atc ata gcc tcc   192
Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser
      50                  55                  60

tgc ttc tac tac gtc gcc acc act tac ttc cct ctc ctc cct cac cct   240
Cys Phe Tyr Tyr Val Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro
 65                  70                  75                  80

ctc tcc tac ttc gcc tgg cct ctc tac tgg gcc tgc caa ggg tgc gtc   288
Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val
                  85                  90                  95

cta acc ggc gtc tgg gtc ata gcc cac gag tgc ggc cac cac gcc ttc   336
Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe
              100                 105                 110
```

```
agc gac tac cag tgg ctt gac gac acc gtc ggt ctc atc ttc cac tcc          384
Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser
        115             120             125

ttc ctc ctc gtc cct tac ttc tcc tgg aag tac agt cat cga cgc cac          432
Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His
        130             135             140

cat tcc aac act ggc tcc ctc gag aga gac gaa gtg ttt gtc ccc aag          480
His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys
145             150             155             160

aag aag tca gac atc aag tgg tac ggc aag tac ctc aac aac cct ttg          528
Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu
                165             170             175

gga cgc acc gtg atg tta acg gtt cag ttc act ctc ggc tgg ccg ttg          576
Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu
                180             185             190

tac tta gcc ttc aac gtc tcg gga aga cct tac gac ggc ggc ttc gct          624
Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Ala
            195             200             205

tgc cat ttc cac ccc aac gct ccc atc tac aac gac cgc gag cgt ctc          672
Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu
        210             215             220

cag ata tac atc tcc gac gct ggc atc ctc gcc gtc tgc tac ggt ctc          720
Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu
225             230             235             240

ttc cgt tac gcc gcc gcg cag gga gtg gcc tcg atg gtc tgc ttc tac          768
Phe Arg Tyr Ala Ala Ala Gln Gly Val Ala Ser Met Val Cys Phe Tyr
            245             250             255

gga gtc ccg ctt ctg att gtc aat ggt ttc ctc gtg ttg atc act tac          816
Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr
            260             265             270

ttg cag cac acg cat cct tcc ctg cct cac tac gat tcg tcc gag tgg          864
Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp
        275             280             285

gat tgg ttg agg gga gct ttg gct acc gtt gac aga gac tac gaa atc          912
Asp Trp Leu Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Glu Ile
        290             295             300

ttg aac aag gtc ttc cac aat att acc gac acg cac gtg gcg cat cat          960
Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His
305             310             315             320
```

```
ctg ttc tcc acg atg ccg cat tat cac gcg atg gaa gct acc aag gcg      1008
Leu Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala
            325             330             335

ata aag ccg ata ctg gga gag tat tat cag ttc gat ggg acg ccg gtg      1056
Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Phe Asp Gly Thr Pro Val
            340             345             350

gtt aag gcg atg tgg agg gag gcg aag gag tgt atc tat gtg gaa ccg      1104
Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro
            355             360             365

gac agg caa ggt gag aag aaa ggt gtg ttc tgg tac aac aat aag tta      1152
Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu
            370             375             380

tga                                                                   1155
```

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<210> 18
<211> 384
<212> PRT
<213> Brassica napus

<400> 18
Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser
 1               5                  10                  15
Glu Thr Asp Thr Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr
            20                  25                  30
Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser
            35                  40                  45
Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser
      50                  55                  60
Cys Phe Tyr Tyr Val Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro
 65               70                  75                  80
Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val
                  85                  90                  95
Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe
            100                 105                 110
Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser
            115                 120                 125
Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His
      130                 135                 140
His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys
145                 150                 155                 160
Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu
                  165                 170                 175
Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu
            180                 185                 190
Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Ala
            195                 200                 205
Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu
      210                 215                 220
Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu
```

```
225                 230                 235                 240
Phe Arg Tyr Ala Ala Ala Gln Gly Val Ala Ser Met Val Cys Phe Tyr
                245                 250                 255
Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr
                260                 265                 270
Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp
                275                 280                 285
Asp Trp Leu Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Glu Ile
        290                 295                 300
Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His
305                 310                 315                 320
Leu Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala
                325                 330                 335
Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Phe Asp Gly Thr Pro Val
                340                 345                 350
Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro
        355                 360                 365
Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu
        370                 375                 380
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<210> 19
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 19
ggatatgatg atggtgaaag a                                              21

<210> 20
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 20
tctttcacca tcatcatatc c                                              21

<210> 21
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 21
gttatgaagc aaagaagaaa c                                              21

<210> 22

<211> 26
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 22
gtttcttctt tgctttgctt cataac                                          26

<210> 23
<211> 32
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 23
caucaucauc aucttcttcg tagggttcat cg                                   32

<210> 24
<211> 33
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 24
cuacuacuac uatcatagaa gagaaaggtt cag                                  33

<210> 25
<211> 32
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 25
caucaucauc aucatgggtg cacgtggaag aa                                   32

<210> 26
<211> 33
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 26
cuacuacuac uatctttcac catcatcata tcc                                  33

<210> 27
<211> 30
<212> PRT
<213> Arabidopsis thaliana

<400> 27
Ile Trp Val Ile Ala His Glu Cys Gly His His Ala Phe Ser Asp Tyr
 1               5                  10                  15
Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser Phe
            20                  25                  30

<210> 28
<211> 30
<212> PRT
<213> Glycine max

<400> 28
Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe Ser Lys Tyr
 1               5                  10                  15
Gln Trp Val Asp Asp Val Val Gly Leu Thr Leu His Ser Thr
            20                  25                  30

<210> 29
<211> 30
<212> PRT
<213> Zea mays

<400> 29
Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe Ser Asp Tyr
 1               5                  10                  15
Ser Leu Leu Asp Asp Val Val Gly Leu Val Leu His Ser Ser
            20                  25                  30

<210> 30
<211> 29
<212> PRT
<213> Ricinus communis

<400> 30
Trp Val Met Ala His Asp Cys Gly His His Ala Phe Ser Asp Tyr Gln
 1               5                  10                  15
Leu Leu Asp Asp Val Val Gly Leu Ile Leu His Ser Cys
            20                  25

<210> 31
<211> 29
<212> PRT
<213> Arabidopsis thaliana

<400> 31
Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His His
 1               5                  10                  15
Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val

                20                          25

<210> 32
<211> 29
<212> PRT
<213> Glycine max

<400> 32
Leu Leu Val Pro Tyr Phe Ser Trp Lys Ile Ser His Arg Arg His His
 1               5                  10                  15
Ser Asn Thr Gly Ser Leu Asp Arg Asp Glu Val Phe Val
            20                  25


<210> 33
<211> 29
<212> PRT
<213> Zea mays

<400> 33
Leu Met Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His His
 1               5                  10                  15
Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val
            20                  25


<210> 34
<211> 29
<212> PRT
<213> Ricinus communis

<400> 34
Leu Leu Val Pro Tyr Phe Ser Trp Lys His Ser His Arg Arg His His
 1               5                  10                  15
Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val
            20                  25


<210> 35
<211> 36
<212> PRT
<213> Arabidopsis thaliana

<400> 35
Asp Arg Asp Tyr Gly Ile Leu Asn Lys Val Phe His Asn Ile Thr Asp
 1               5                  10                  15
Thr His Val Ala His His Leu Phe Ser Thr Met Pro His Tyr Asn Ala
            20                  25                  30
Met Glu Ala Thr
        35


<210> 36
<211> 36
<212> PRT
<213> Glycine max

<400> 36
Asp Arg Asp Tyr Gly Ile Leu Asn Lys Val Phe His His Ile Thr Asp
 1               5                  10                  15
Thr His Val Ala His His Leu Phe Ser Thr Met Pro His Tyr His Ala
            20                  25                  30
Met Glu Ala Thr
        35


<210> 37
<211> 36
<212> PRT
<213> Zea mays


<400> 37
Asp Arg Asp Tyr Gly Ile Leu Asn Arg Val Phe His Asn Ile Thr Asp
 1               5                  10                  15
Thr His Val Ala His His Leu Phe Ser Thr Met Pro His Tyr His Ala
            20                  25                  30
Met Glu Ala Thr
        35


<210> 38
<211> 27
<212> PRT
<213> Ricinus communis


<400> 38
Asp Arg Asp Tyr Gly Ile Leu Asn Lys Val Phe His Asn Ile Thr Asp
 1               5                  10                  15
Thr Gln Val Ala His His Leu Phe Thr Met Pro
            20                  25


<210> 39
<211> 16
<212> PRT
<213> Arabidopsis thaliana


<400> 39
Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu Gly Arg Ile Met
 1               5                  10                  15


<210> 40
<211> 16
<212> PRT
<213> Glycine max


<400> 40
Val Ala Trp Phe Ser Leu Tyr Leu Asn Asn Pro Leu Gly Arg Ala Val
 1               5                  10                  15


<210> 41
<211> 16
<212> PRT

<213> Zea mays

<400> 41
Pro Trp Tyr Thr Pro Tyr Val Tyr Asn Asn Pro Val Gly Arg Val Val
  1               5               10              15

<210> 42
<211> 16
<212> PRT
<213> Ricinus communis

<400> 42
Ile Arg Trp Tyr Ser Lys Tyr Leu Asn Asn Pro Pro Gly Arg Ile Met
  1               5               10              15

<210> 43
<211> 22
<212> PRT
<213> Arabidopsis thaliana

<400> 43
Trp Ala Leu Phe Val Leu Gly His Asp Cys Gly His Gly Ser Phe Ser
  1               5               10              15
Asn Asp Pro Lys Leu Asn
            20

<210> 44
<211> 22
<212> PRT
<213> Brassica napus

<400> 44
Trp Ala Leu Phe Val Leu Gly His Asp Cys Gly His Gly Ser Phe Ser
  1               5               10              15
Asn Asp Pro Arg Leu Asn
            20

<210> 45
<211> 22
<212> PRT
<213> Glycine max

<400> 45
Trp Ala Leu Phe Val Leu Gly His Asp Cys Gly His Gly Ser Phe Ser
  1               5               10              15
Asn Asn Ser Lys Leu Asn
            20

<210> 46
<211> 22
<212> PRT
<213> Arabidopsis thaliana

<400> 46
Trp Ala Ile Phe Val Leu Gly His Asp Cys Gly His Gly Ser Phe Ser
 1               5                  10                  15
Asp Ile Pro Leu Leu Asn
              20


<210> 47
<211> 10
<212> PRT
<213> Artificial Sequence

<220>
<223> exemplary motif

<400> 47
Asp Arg Asp Tyr Gly Ile Leu Asn Lys Val
 1               5                  10


<210> 48
<211> 22
<212> PRT
<213> Glycine max

<400> 48
Trp Ala Leu Phe Val Leu Gly His Asp Cys Gly His Gly Ser Phe Ser
 1               5                  10                  15
Asp Ser Pro Pro Leu Asn
              20


<210> 49
<211> 29
<212> PRT
<213> Arabidopsis thaliana

<400> 49
Ile Leu Val Pro Tyr His Gly Trp Arg Ile Ser His Arg Thr His His
 1               5                  10                  15
Gln Asn His Gly His Val Glu Asn Asp Glu Ser Trp His
              20                  25


<210> 50
<211> 10
<212> PRT
<213> Artificial Sequence

<220>
<223> exemplary motif

<400> 50
Asp Arg Asp Tyr Glu Ile Leu Asn Lys Val
 1               5                  10


<210> 51

<211> 29
<212> PRT
<213> Glycine max

<400> 51
Ile Leu Val Pro Tyr His Gly Trp Arg Ile Ser His Arg Thr His His
 1               5                   10                  15
Gln His His Gly His Ala Glu Asn Asp Glu Ser Trp His
            20                  25


<210> 52
<211> 29
<212> PRT
<213> Arabidopsis thaliana

<400> 52
Ile Leu Val Pro Tyr His Gly Trp Arg Ile Ser His Arg Thr His His
 1               5                   10                  15
Gln Asn His Gly His Val Glu Asn Asp Glu Ser Trp Val
            20                  25


<210> 53
<211> 6
<212> PRT
<213> Artificial Sequence

<220>
<223> exemplary motif

<400> 53
Lys Tyr His Asn Asn Pro
 1               5


<210> 54
<211> 29
<212> PRT
<213> Glycine max

<400> 54
Ile Leu Val Pro Tyr His Gly Trp Arg Ile Ser His Arg Thr His His
 1               5                   10                  15
Gln Asn His Gly His Ile Glu Lys Asp Glu Ser Trp Val
            20                  25


<210> 55
<211> 6
<212> PRT
<213> Brassica napus

<400> 55
Gly His Asp Cys Ala His
 1               5


<210> 56

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<211> 6
<212> PRT
<213> Brassica napus

<400> 56
Gly His Lys Cys Gly His
  1                   5


<210> 57
<211> 6
<212> PRT
<213> Brassica napus

<220>
<221> VARIANT
<223> amino acid residues 94-99 of Canola-Fad3

<400> 57
Gly His Asp Cys Gly His
  1                   5


<210> 58
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> exemplary motif

<400> 58
His Lys Cys Gly His
  1               5


<210> 59
<211> 12
<212> DNA
<213> Phaseolus vulgaris

<400> 59
tggtcttttg gt                                                    12


<210> 60
<211> 5
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<213> Artificial Sequence

<220>
<223> exemplary motif

<400> 60
His Glu Cys Gly His
  1               5


<210> 61
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<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> exemplary motif

<400> 61
His Arg Arg His His
  1               5


<210> 62
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> exemplary motif

<400> 62
His Arg Thr His His
  1               5


<210> 63
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> exemplary motif

<400> 63
His Val Ala His His
  1               5


<210> 64
<211> 6
<212> PRT
<213> Artificial Sequence

<220>
<223> exemplary motif

<400> 64
Lys Tyr Leu Asn Asn Pro
  1               5


<210> 65
<211> 29
<212> PRT
<213> Brassica napus

<400> 65
Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe Ser Asp Tyr
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```
     1                5                          10                         15
Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser
              20                    25
```

<210> 66
<211> 36
<212> PRT
<213> Brassica napus

<400> 66
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Asp Arg Asp Tyr Gly Ile Leu Asn Lys Val Phe His Asn Ile Thr Asp
 1                5                          10                         15
Thr His Val Ala His His Leu Phe Ser Thr Met Pro His Tyr His Ala
              20                    25                    30
Met Glu Ala Thr
          35
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<210> 67
<211> 16
<212> PRT
<213> Brassica napus

<400> 67
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Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu Gly Arg Thr Val
 1                5                          10                         15
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<210> 68
<211> 6
<212> PRT
<213> Artificial Sequence

<220>
<223> exemplary motif

<400> 68
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Ala His Lys Cys Gly His
 1                5
```

<210> 69
<211> 6
<212> PRT
<213> Artificial Sequence

<220>
<223> exemplary motif

<400> 69
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Ala His Glu Cys Gly His
 1                5
```

<210> 70
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> exemplary motif

<400> 70
His Asp Cys Gly His
 1               5